CLAIMS

What is claimed is:

1. An apparatus for facilitating wireless communication in a network between a first communication device and a second communication device, said network including at least two bi-directional communication frequencies each using a time division duplex format of data transmission, comprising:

a receiver for receiving signals on said at least two bi-directional communication frequencies simultaneously;

a signal detector operatively coupled to the receiver for determining if a signal is present on at least one of said at least two bi-directional frequencies;

a frequency converter for converting the signal present on one of said bi-directional frequencies to a converted signal on the other of said bi-directional frequencies; and

a transmitter for transmitting the converted signal on the other of said bi-directional frequencies.

2. The apparatus of Claim 1, wherein said signal detector operates at an intermediate frequency.

3. The apparatus of Claim 1, wherein said signal detector is for detecting the signal at a radio frequency.

4. The apparatus of Claim 1, wherein said receiver is for receiving the signals on said at least two bi-directional frequencies simultaneously over a first antenna, and

said transmitter is for transmitting the converted signal on the other of said bi-directional frequencies over a second antenna.

5. The apparatus of claim 4, wherein said first and second antennas have respective polarizations that are largely orthogonal to one another.

6. The apparatus of Claim 1, wherein said receiver and said transmitter share a single antenna that is connected to said receiver and said transmitter through an isolator.

7. The apparatus of Claim 1, wherein said receiver includes first and second single frequency channel receivers, where the first single frequency channel receiver and a transmitter for a first frequency channel share a first directionally isolated antenna, and the second single frequency channel receiver and a transmitter for the second frequency channel share a second directionally isolated antenna.

8. The apparatus of Claim 1, wherein said receiver includes a signal splitter connected to an input of said receiver, and said frequency converter

comprises first and second frequency converters, each output of the splitter being coupled to said first and second frequency converters, such that any signals on each of said at least two bi-directional frequencies will be present on the outputs of the first and second frequency converters respectively at intermediate frequencies, and wherein each of first and second intermediate frequencies is coupled to respective first and second additional splitters, each of which includes a first output connected to a delay circuit and a second output connected to a detector circuit, said delay circuit enabling re-transmission of one of the converted signal occurs using said delay circuit.

9. The apparatus of Claim 8, wherein the delay circuit is for reducing truncation of the received signals to be transmitted to acceptable levels by compensating for detection delay during receipt of the signals on said at least two bi-directional communication frequencies simultaneously by said receiver.

10. The apparatus of Claim 8, wherein each of said first and second frequency converters includes a mixer and a local oscillator, said mixer including a first input coupled to an output of said splitters and a second input coupled to an output of said local oscillator

11. The apparatus of Claim 10, further including intermediate frequency splitters, each of which includes an input connected to an output of one of

said mixers, and detectors, each of which is respectively connected to a first output of one of said intermediate frequency splitters, said detectors for detecting a signal at said receiver based on a power comparison of signals at respective first outputs of said intermediate frequency splitters.

12. The apparatus of Claim 10, wherein said receiver further includes a detector for detecting a signal received at said receiver, said detector indicating a beginning or ending of the signal received by said receiver on one of said bi-directional frequencies.

13. The apparatus of Claim 12, wherein said detector is for comparing the signal received at the receiver to a threshold value to detect the signal.

14. The apparatus of Claim 11, wherein said detectors are for detecting the presence of the signal on one of said bi-directional frequencies, and wherein an output of each of said detectors controls selection of one of the intermediate frequencies for transmission of the converted signal by said transmitter upon detection of the signal on at least one of the bi-direction frequencies.

15. The apparatus of Claim 11, further comprising:

delay circuits each connected to a second output of said intermediate frequency splitters, and to a single switch capable of coupling one of the delay circuits to a frequency converter for changing a frequency of a coupled intermediate frequency signal to the other of said the bi-directional frequencies prior to transmission.

16. A wireless local area network including at least first and second bi-directional communication frequencies, comprising:

a first communication device capable of transmitting and receiving data on said first and said second bi-directional communication frequencies, wherein said first communication device transmits and receives data using a time division duplex format on either of said at least first or second bi-directional communication frequencies,

a second communication device capable of transmitting and receiving data on said first and said second bi-directional communication frequencies, wherein said first communication device transmits and receives data using a time division duplex format on either of said at least first or second bi-directional communication frequencies,

a repeater for improving a communication link between said first and said second communication devices, said repeater including a receiver capable of simultaneously receiving a signal on either of said first and said second bi-directional communication frequencies, a signal detector

operatively coupled to the receiver that determines if the signal is present on one of said at least two bi-directional frequencies, a frequency converter operatively coupled to the signal detector for converting the signal present on the one of said bi-directional frequencies to a converted signal on the other of said bi-directional frequencies, and a transmitter that transmits the converted signal on the other of said bi-directional frequencies.

17. The wireless local area network of Claim 16, wherein at least one of said first or said second communication devices is connected to a wired network and serves as a wireless gateway

18. A repeater for a network including at least first and second bi-directional communication frequencies, comprising:

a receiver for receiving a signal on either of said at least first and second bi-directional communication frequencies simultaneously,

a transmitter for transmitting the received signal on said at least first and second bi-directional communication frequencies; and

an antenna operationally connected to said receiver and said transmitter, wherein said transmitter and said receiver operate on different frequencies and use a time division duplex protocol.

19. The repeater of Claim 18, further including a circulator for receiving a signal information packet on said receiver on said first bi-directional

communication frequency and for transmitting the signal information packet using said transmitter on said second bi-directional communication frequency.

20. The repeater of Claim 19, wherein said receiver includes a signal detector operatively coupled to the circulator that determines if the signal is present on one of said at least first and second bi-directional communication frequencies, and a frequency converter operatively coupled to the receiver for converting the signal present on one of said at least first and second bi-directional communication frequencies to the other of said at least first and second bi-directional communication frequencies.

21. The repeater of Claim 19, wherein said detector includes a power indicator that detects the signal received at said receiver on one of said at least first and second bi-directional communication frequencies.

22. A network operating on at least first and second bi-directional communication frequencies, comprising:

a base unit for transmitting and receiving data on said first and second bi-directional communication frequencies using a time division duplex protocol on either of said at least first or second bi-directional communication frequencies,

a client unit capable of transmitting and receiving data on said first and said second bi-directional communication frequencies using the time division duplex protocol on either of said at least first or second bi-directional communication frequencies, and

a repeater capable of communicating between said base unit and said client unit using the time division duplex protocol on one of said at least first or second bi-directional communication frequencies different from that used by said client unit.

23. The network of Claim 22, wherein said repeater includes:

a receiver for receiving signals on said at least first and second bi-directional communication frequencies simultaneously;

a signal detector operatively coupled to the receiver for determining if a signal is present on at least one of said at least first and second bi-directional communication frequencies;

a frequency converter for converting a signal present on the first bi-directional frequency to a converted signal on the second bi-directional communication frequency, and

a transmitter that transmits the converted signal on the second bi-directional communication frequency.

24. The network of Claim 23, wherein a duration of the transmission of the detected signal on one of the at least first and second bi-directional communication frequencies is based at least in part on a time duration counter started when the detected signal is detected.

25. The network of Claim 23, where said receiver is connected to a first antenna and said transmitter is connected to a second antenna, wherein the first and second antennas have largely orthogonal polarizations.

26. The network of Claim 23 where said receiver for each of the at least first and second bi-directional communication frequencies is connected to at least two switches respectively, each of which is coupled to at least two directional antennas respectively and to an additional switch, which in turn is coupled to at least one transmitter.

27. A wireless coverage extension device capable of receiving and transmitting wireless signals from/to a first wireless station device and to/from a second wireless station device, allowing the first and second wireless station device to communicate, the wireless coverage extension device including an indicator for providing indication when received signal levels from at least one of the station devices are sufficient for communication between at least one of the first and second wireless station devices and the wireless coverage extension device.

28. A wireless coverage extension device capable of receiving and transmitting wireless signals from/to a first wireless station device on a first bi-directional communication link and to/from a second wireless station device on a second bi-directional communication link, allowing the first and second wireless station devices to communicate, the first bi-directional communication link operating on a first frequency channel utilizing a first antenna of a specific polarization, and the second bi-directional communication link operating on a second frequency channel utilizing a second antenna with a polarization orthogonal to the first antenna.

29. The wireless coverage extension device of Claim 28, where the first and second bi-directional communication links utilize 802.11 protocol or a derivative thereof.

30. The wireless coverage extension device of Claim 29, further comprising a demodulator for digital demodulating the detected signal during re-transmission thereof.

31. In a wireless communication device, a method of re-transmitting a detected signal with amplification and/or frequency conversion comprising:

performing a splitting function on the signal;

coupling the splitting function to a delay function;

additionally coupling the splitting function to a detection function;

performing the delay function in parallel with the detection function; and

transmitting the signal using a transmitter function subsequent to the performing of the delay function, the transmitter function being coupled to the delay function and activated based on detection of the signal by the detection function.

32. The method of Claim 31, wherein the delay function is sufficient to enable a reduction in truncation of the signal during transmission due to detection delays.

33. A wireless coverage extension device capable of receiving and transmitting wireless signals from/to a first wireless station device on a first bi-directional communication link and to/from a second wireless station device on a second bi-directional communication link, allowing the first and second wireless station devices to communicate, the first bi-directional communication link operating on a first frequency channel utilizing a first directional antenna, and the second bi-directional communication link operating on a second frequency channel utilizing a second directional antenna.